(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 120 564**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **17.01.90**

(51) Int. Cl.[5]: **D 04 H 13/00**, B 32 B 5/02, D 04 H 1/48

(21) Application number: **84300564.6**

(22) Date of filing: **30.01.84**

(54) **Reinforced fabric laminate.**

(30) Priority: **31.01.83 US 462490**

(43) Date of publication of application:
03.10.84 Bulletin 84/40

(45) Publication of the grant of the patent:
17.01.90 Bulletin 90/03

(84) Designated Contracting States:
BE DE FR GB IT LU NL SE

(56) References cited:
DE-A-1 503 736
DE-A-1 560 778
DE-A-3 005 747
FR-A-2 343 595

(73) Proprietor: **CHICOPEE**
317 George Street
New Brunswick New Jersey 08903 (US)

(72) Inventor: **Buyofsky, Conrad C.**
10 Lyons Street
South River NJ 08882 (US)
Inventor: **Kennette, John Wilson**
192 Dukes Parkway
Somerville NJ 08876 (US)

(74) Representative: **Jones, Alan John et al**
CARPMAELS & RANSFORD 43 Bloomsbury Square
London, WC1A 2RA (GB)

EP 0 120 564 B1

Courier Press, Leamington Spa, England.

Descripti n

Background of the Inventi n

It is known to combine a reinforcing layer such as a scrim with one or two paper layers to form a reinforced towel. Reinforced wipes employing a scrim between layers of non-woven materials are also known in the art. One such structure, marketed as an industrial wipe, comprised a pulp-filled, long fiber, carded wipe with a floating scrim center, and specifically comprised a layer of long fibers, a pulp layer, the scrim, a pulp layer, and another layer of long fibers. The wipe contained binder material which extended through the layers of the wipe and anchored the scrim. The scrim was not separately bonded to the pulp. Another nonwoven reinforced fabric wipe comprised a reinforced fluid entangled fibrous wipe consisting of a layer of entangled fibers, a reinforcing scrim, and another layer of entangled fibers, said scrim being attached to the fibrous layers by heat sealing or adhesive. Entangled fiber fabrics are very expensive and difficult to produce.

The reinforced fabric laminate of the present invention comprises a cloth-like nonwoven reinforced laminate which may be made at a relatively low cost, exhibits excellent abrasion resistance, dimensional stability and absorbency. The fibrous layers used in manufacturing the laminate are loosely entangled layers with a low level of binder, sufficient to maintain the outer surface integrity of the layer. Such layers are less expensive to manufacture than the entangled fabric layers of the prior art wipes. According to the method of the present invention, the binder material is printed on one surface only of each of the fibrous layers which make up the fabric laminate, and according to the present invention, the fabric laminate is produced by a process which disposes the binder side of the fibrous layers on the outside surfaces of the fabric laminate.

DE—A—3005747 discloses a method of producing a strong, durable nonwoven fabric comprising: (a) forming a layer of overlapping intersecting fibres made of polyester, polyolefin or both; (b) supporting the layer on an apertured support member; (c) directing essentially columnar jets of fluid against the supported layer to rearrange the fibres into a regular repeated pattern of lightly entangled fibre regions; and (d) applying an effective amount of an adhesive bonding material to the rearranged layer. The resultant fabric has fibres disposed in a regular repeating pattern of lightly entangled fibre regions of higher area density than the average area density of the layer, and interconnecting fibres extending between the lightly entangled fibre regions, which fibres are randomly entangled with each oth r in said r gions. The adhesive binder material can be distributed in the fabric in a spaced int rmittent pattern of binder sites, r it can be uniformly distributed through ut the fabric.

DE—A—3005747 does not disclose a fabric laminate or a reinforced n nwoven fabric

Summary of the Invention

The present invention comprises the method of making a low cost, nonwoven, reinforced fabric laminate comprising two layers of loosely entangled fibres and an interposed reinforcing layer. The fabric laminate has excellent abrasion resistance, dimensional stability and absorbency.

Each of the fibrous layers of the fabric laminate is assembled by sujecting a web of fibres comprising absorbent fibres and high strength fibres to fluid entangling forces to form a loosely entangled fibrous layer having a jet side and a belt side, and applying binder to the jet side of each fibrous layer. The web may be dried prior to application of the binder, and the binder may be dried prior to assembling the fibrous layers into the fabric laminate.

A loosely entangled fibrous layer has greater abrasion resistance at the jet side. Binder is usually provided on the belt side of a loosely entangled fibrous layer, however, according to the method of the present invention, the surface binder is added to the jet side of each of the two fibrous layers. The fabric laminate is assembled by superimposing the first fibrous layer, a reinforcing layer and the second fibrous layer with the belt side having less abrasion resistance, next adjacent the reinforcing layer. The binder may be printed on the fibrous layers prior to forming the laminate or may be printed on the laminate. The reinforcing layer is attached to the two fibrous layers. The reinforcing layer may be thermoplastic, and may be secured to the first and second fibrous layers by the use of heat. The reinforcing layer may comprise a scrim, and in particular, a fibrous netting covered with thermoplastic material. The nonwoven, rienforced fibrous material of the present invention may be used as a wipe giving excellent abrasion resistance, dimensional stability and absorbency.

Detailed Description of the Invention

The nonwoven, reinforced fabric laminate of the present invention utilizes loosely entangled fibrous layers having a pattern of high density regions interconnected by fibers extending beteen the regions. Such loosely entangled or entangled fibrous layers have a jet side disposed closer to the jets of fluid during the entangling process, and a belt side. The jet side has greater abrasion resistance. To said loosely entangled layers is added an effective amount of binder to give the fibrous layer the sufficient abrasion resistance and cohesiveness for the intended end-use application. These loosely entangled fibrous layers have been provided with binder throughout or with surface binder, however in the method and fabric laminate of the present invention, the fibrous layers making up the fabric laminate are produced by printing binder on the surface of the jet side f each f th loosely entangled fibrous layers. In a preferred embodiment, the layers are

dried prior to print bonding.

Th method of th present invention involves assembling two fibrous lay rs by loos ly entangling a web of fibers c mprising absorb nt fibers and high strength fibers utilizing high speed essentially columnar jets of fluid to form the fabric layers. Binder is printed on the jet side of the layers prior to superimposing the layers in the laminate or after the layers are superimposed. The laminar structure is then assembled by superimposing the two fibrous layers with a reinforcing layer therebetween. The laminar structure is assembled so that the belt side of the entangled fibrous layers are next adjacent the reinforcing layer. The jet sides of the fibrous layers comprise the outer surfaces of the reinforced fabric laminate. The reinforcing layer is then secured to the first and second fibrous layers. If the binder is not added before the laminate is assembled, the binder may be printed on the laminate either before or after the reinforcing layer is secured to the fibrous layers. The reinforcing layer may comprise a thermoplastic material which may be heat bonded to the first and second fibrous layers. It is essential that the reinforcing layer not be destroyed in the laminating process, but remain to lend dimensional stability to the laminate. It is not essential that the reinforcing layer be thermoplastic as it may be adhesively secured to the first and second fibrous layers. The reinforcing layer may comprise a scrim or a netting. In its most preferred embodiment, the reinforcing layer comprises a fibrous netting with a thermoplastic coating.

The nonwoven, reinforced fabric laminate of the present invention and the method of making the same comprises a low cost alternative to reinforced entangled fabric laminates. The fabric laminate has good utility as a wipe, and in particular, possess excellent abrasion resistance, dimensional stability and absorbency.

Each of the nonwoven fibrous layers of the reinforced fabric laminate of the invention is made by forming a web of overlapping, intersecting fibers, supporting the web on an apertured pattern member having apertures arranged in a pattern, directing high speed jets of fluid at the web to randomly and loosely entangle the web into a fibrous layer having a pattern of high density regions interconnected by fibers extending between regions, said layer having a jet side disposed nearest the jets, and applying adhesive binder material to the jet side of the layer of loosely entangled fibers. The fibrous layer may be dried before the application of binder, and the binder may be added before or after superimposing the fibrous layers to form the laminate.

The fibrous web can be formed in any convenient known manner, as by air-laying or carding. The web is then loosely entangled using meth d and apparatus similar to th se disclosed by Evans in U.S. Patent No. 3,485,706. It is an important feature of the invention that the fibrous layer is loosely entangled. For instance, it is preferr d that the lo sely entangled fibr us layer have a structural measure of fiber entanglement of less than 0.1. (The test procedure for measuring the structural measure of fiber entanglement is set forth in publish d British patent application No. 2 045 825.

A typical apparatus for making the fibrous layer used in the process of the invention employs rows of orifices thorugh which fluid (usually water) under pressure forms essentially columnar jets. A suitable apparatus has up to 20—25 rows of orifices, with about 30—50 orifices per linear inch (per 2.5 cm). The orifices are preferably circular, with diameters of from 0.005 to 0.007 inch (0.13—0.18 mm). The travelling fibrous web can be positioned about 1—2 inches (2.5—5.1 cm) below the orifices.

Using the above-described typical apparatus, representative conditions include a liquid pressure of about 200—700 psi (1.38—4.8 MPa) and a web speed of up to 100 yards per minute (1.5 m/s), for a fibrous web weighing about ½ to 2—½ ounces per square yard (17—84.8 g/m²). Routine experimentation that is well within the ordinary skill in the art will suffice to determine the desired conditions for particular cases.

According to one embodiment of the method of the present invention, after the fibrous layer has been loosely entangled, it is surface bonded, preferably print bonded, by passing the fibrous layer through a print bonding station employing a set of counterrotating rolls comprising the upper (back-up) roll which is adjustable, and the lower (applicator) roll which is engraved with a predetermined pattern to be printed. The lower roll is partially immersed in a bath of binder solution or suspension. As the roll rotates, it picks up binder, and a doctor blade wipes the roll clean except for the binder contained in the engraved pattern. As the fibrous layer passes through the nip between the rolls, the binder is printed on the layer from the engraved pattern. This procedure is well known in the art. U.S. Patents which disclose such print bonding of nonwoven fibrous webs includes nos. 2,705,498, 2,705,687, 2,705,688, 2,880,111, and 3,009,822. If desired the fibrous layer may also be overall saturation bonded. It is preferred that the fibrous layers be dried prior to the application of the binder material.

The adhesive binder employed can be any of the aqueous latex binders that are conventionally employed as binders for nonwoven fabrics. Such binders, include acrylics, ethylene-vinyl acetate copolymers, SBR latex rubbers, and the like.

After the binder has been applied, the printed fibrous layer may be dried in the usual fashion, as by passing the web over a series of drying cans.

The binder is employed in an effective amount, that is, that amount which will result in a fibrous layer having sufficient abrasion resistance for the intended end-use application. In addition, the binder prevents disentangling of the surface fibers, thereby maintaining the cohesiveness of the fibrous layer and laminate. The exact amount of binder employed depends, in part, upon factors, such as nature f binder, and the like. Usually, an

effective amount will be found within the range of from about 5 to about 30 weight percent, based upon weight of fibers plus binder.

The fibers used in the reinforced fabric and process of the invention are a combination of absorbent or hydrophilic fibers such as rayon, cotton, and high strength fibers such as polyester, polyolefin, acrylic, or nylon fibers. The fibers may have a denier of from 1 to 1.5 (0.11—0.17 tex) or more and they may be in the form of short fibers such as $\frac{1}{4}$ inch (0.63 cm) in length upto as long as continuous filament fibers. Preferably, fibers in the range of $\frac{3}{4}$ to 2 inches (1.9—5.1 cm) in length are used. The weight of the fibrous layers used in the present invention may vary from 100 grains per square yard (7.75 g/m^2) to a few thousand grains per square yard (a few times 78 g/m^2).

Though it is generally known that the presence of binder reduces absorbency, and that the jet side surface of a loosely entangled fibrous layer has greater abrasive resistance than the belt side of the fabric layer; adding binder to the jet side, or strength to strength, made possible by the use of the reinforcing layer, is not known or obvious. The fibrous layers and the fabric laminate maintain all the absorbency of the non-bonded loosely entangled belt side of the fibrous web, and require that less binder be added to the stronger jet side to achieve excellent abrasion resistance while giving good feel.

The foregoing description is illustrative but is not to be taken as limiting. Other variations and modifications are possible without departing from the spirit and scope of the present invention.

Claims

1. A method of making a low cost, nonwoven, reinforced fabric laminate having excellent abrasion resistance, dimensional stability and absorbency comprising the steps of:

(a) loosely entangling a web of fibers utilizing high speed essentially columnar jets of fluid to form a first fibrous layer having a jet side and an other side;

(b) applying binder to the jet side of the first fabric layer;

(c) superimposing a reinforcing layer upon the other side of said first fabric layer;

(d) loosely entangling a web of fibers utilizing high speed essentially columnar jets of water to form a second fibrous layer having a jet side and an other side;

(e) applying binder to the jet side of said second fabric layer;

(f) superimposing said second fibrous layer upon said first fibrous layer and reinforcing layer, with the other side of said second fibrous layer next adjacent the reinforcing layer; and

(g) securing said reinforcing layer to each of said first and second fibrous layers.

2. A method of making a low cost, nonwoven reinforced fabric laminate having excellent abrasion resistance, dimensional stability and absorbency comprising the steps of loosely entangling each of two separate webs of fibers utilizing high speed essentially columnar jets of fluid to form first and second separate fibrous layers, each having a jet side and an other side, superimposing said first and second fabric layers and a reinforcing layer with the other side of the first and second fibrous layers next adjacent the reinforcing layer, and then, in either order, securing the reinforcing layer to the first and second fibrous layers, and applying binder to the jet side of the first and second fibrous layers now forming the outer surfaces of the fabric laminate.

3. The method of claim 1 or claim 2 wherein said fibers comprise both absorbent fibers and high strength fibers.

4. The method of claim 3 wherein said absorbent fibers are cotton and/or rayon, and said high strength fibers are polyester, polyolefin, acrylic or nylon fibers.

5. The method further comprising the step of drying the binder prior to superimposing the first and second fibrous layers and the reinforcing layer.

6. The method of any one of claims 1 to 5 wherein said reinforcing layer is thermoplastic and is secured to said first and second fibrous layers by the use of heat.

7. The method of any one of claims 1 to 6 wherein said reinforcing layer comprises a scrim.

8. An nonwoven reinforced fabric laminate, comprising two layers of loosely entangled fibers and an interposed reinforcing layer attached to the layers of fibers, each layer of loosely entangled fibers having a pattern of high density regions interconnected by fibers extending between the regions and having a jet side and another side, the jet sides of the fibrous layers forming the outer surfaces of the fabric laminate and having binder applied thereto.

Patentansprüche

1. Verfahren zur Herstellung eines preiswerten verstärkten Vliesgewebe-Laminats mit hervorragender Verschließfestigkeit, Dimensionsstabilität und Absorption, wobei das Verfahren folgende Schritte umfaßt:

(a) lockeres Verfilzen eines Faser-Gewebes unter Verwendung von im wesentliche Säulenartigen Hochgeschwindigkeits-Flüssigkeitsdüsen unter Bildung einer ersten faserigen Schicht mit einer den Düsen zugewandten Seite und einer anderen Seite;

(b) Aufbringen von Binder auf die den Düsen zugewandte Seite der ersten Gewebeschicht;

(c) Auflegen einer Verstärkungsschicht auf die andere Seite der ersten Gewebeschicht;

(d) lockeres Verfilzen eines Faser-Gewebes unter Verwendung von im wesentlichen Säulenartigen Hochgeschwindigkeits-Waserdüsen unter Bildung einer zweiten faserigen Schicht mit einer den Düsen zugewandten Seite und einer anderen Seite;

(e) Aufbringen von Binder auf die den Düsen zugewandte Seite der zweiten Gewebeschicht;

(f) Auflegen der zweiten faserigen Schicht auf di erste faserige Schicht und die Verstärkungsschicht, wobei die andere Seite der zweiten faserigen Schicht am nächsten benachbart der Verstärkungsschicht zu liegen kommt; und

(g) Befestigen der Verstärkungsschicht sowohl an der ersten als auch an der zweiten faserigen Schicht.

2. Verfahren zur Herstellung eines preiswerten verstärkten Vliesgewebe-Laminats mit hervorragender Verschleißfestigkeit, Dimensionsstabilität und Absorption wobei das Verfahren folgende Schritte umfaßt: lockeres Verfilzen jeweils zweier getrennter Faser-Gewebe unter Verwendung von im wesentlichen Säulen-artigen Hochgeschwindigkeits-Flüssigkeitsdüsen unter Bildung einer ersten und einer zweiten faserigen Schicht mit jeweils einer den Düsen zugewandten Seite und einer anderen Seite, Aufeinanderlegen der ersten und zweiten Gewebeschichten und einer Verstärkungsschicht, wobei die andere Seite der ersten und zweiten Gewebeschicht am nächsten benachbart der Verstärkungsschicht zu liegen kommt, und danach in beliebiger Reihenfolge Befestigen der Verstärkungsschicht an der ersten und an der zweiten faserigen Schicht und Aufbringen von Binder auf die den Düsen zugewandte Seite der ersten und der zweiten faserigen Schicht unter Bildung der äußeren Oberflächen des Gewebe-Laminats.

3. Verfahren nach Anspruch 1 oder Anspruch 2, worin die Fasern sowohl absorbierende Fasern als auch Fasern mit hoher Festigkeit umfassen.

4. Verfahren nach Anspruch 3, worin die absorbierenden Fasern Baumwolle- und/oder Viskose-(Rayon-) Fasern und die Fasern hoher Festigkeit Polyester-, Polyolefin-, Acryl- oder Nylon-Fasern sind.

5. Verfahren nach Anspruch 1, welches zusätzlich den Schritt des Trocknens des Binders vor dem Aufeinanderlegen der ersten und zweiten faserigen Schichten und der Verstärkungsschicht umfaßt.

6. Verfahren nach einem der Ansprüche 1 bis 5, worin die Verstärkunsschicht aus einem thermoplastischen Material besteht und an den ersten und zweiten faserigen Schichten unter Verwendung von Wärme befestigt wird.

7. Verfahren nach einem der Ansprüche 1 bis 6, worin die Verstärkungsschicht ein Mullmaterial umfaßt.

8. Verstärktes Vliesgewebe-Laminat, umfassend zwei Schichten lokker verfilzter Fasern und eine dazwischen angeordnete Verstärkungsschicht, die an den Faserschichten befestigt ist, wobei jede Schicht locker verfilzter Fasern ein Muster von Regionen mit hoher Dichte, die über Fasern, die sich zwischen den Regionen erstrekken, verbunden sind, und eine den Düsen zugewandte Seite und eine andere Seite aufweist, und wobei die den Düsen zugewandten Seit n der faserigen Schichten die äußeren Oberflächen des Gew be-Laminats bilden und Binder aufgetragen enthalten.

Rev ndicati ns

1. Procédé de confection d'un stratifié bon marché d'étoffe non tissée renforcée possédant d'excellentes propriétés de résistance à l'abrasion, de stabilité dimensionnelle et de pouvoir absorbant, qui consiste:

(a) à enchev êtrer de façon lâche un nappe fibreuse utilisant des jets d'un fluide à grande vitesse, esentiellement colomnaire pour former une première couche fibreuse ayant une face à jets et une autre face;

(b) à appliquer un liant au côté des jets de la première couche d'étoffe;

(c) à superposer une couche de renforcement sur l'autre face de ladite première couche d'étoffe;

(d) à enchevêtrer de façon lâche une nappe fibreuse en utilisant des jets d'eau à grande vitesse, essentiellement colomnaire, pour former une seconde nappe fibreuse ayant une face à jets et une autre face;

(e) à appliquer un liant sur la face à jets de ladite seconde couche d'étoffe;

(f) à superposer ladite seconde couche fibreuse sur la première couche fibreuse et la couche de renforcement, l'autre face de ladite seconde couche fibreuse étant adjacente à la couche de renforcement; et

(g) à fixer ladite couche de renforcement auxdites première et seconde couches fibreuses.

2. Procédé de confection d'un stratifié bon marché d'étoffe no tissée renforcée possédant d'excellentes propriétés de résistance à l'abrasion, de stabilité dimensionnelle et de pouvoir absorbant, qui consiste à enchevêtrer de façon lâche chacune des deuxtoiles séparées de fibres en utilisant des jets sensiblement columnaires à grande vitesse d'un fluide pour former une première et une seconde couches firbeuses séparées, comportant chacune une face à jets et une autre face; à superposer lesdites première et seconde couches d'étoffe et une couche de renforcement de façon que l'autre face desdites première et seconde couches soit adjacente à la couche de renforcement; et ensuite dans n'importe quel ordre, à fixer la couche de renforcement aux première et seconde couches fibreuses et à appliquer du liant sur la face à jets des première et seconde couches fibreuses qui forment à ce stade les surfaces extérieures du stratifié d'étoffe.

3. Procédé selon la revendication 1 ou 2, dans lequel lesdites fibres comprennent à la fois des fibres absorbantes et des fibres de haute résistance.

4. Procédé selon la revendication 3, dans lequel lesdites fibres absorbantes sont des fibres de coton et/ou de rayonne, et lesdites fibres de haute résistance sont des fibres de polyester, de polyoléfine, acryliques ou de nylon.

5. Procédé selon la revendication 1, qui consiste en outre à séch r le liant avant de superposer les première et seconde couches fibreuses et la couch de renf rcement.

6. Procédé selon l'une quelconque des revendications 1 à 5, dans lequel la c uch de renforcement est thermoplastique et est fixée auxdites pemièr et seconde couches fibreuses par apport de chaleur.

7. Procédé selon l'une quelconque des revendications 1 à 6, dans lequel la couche de renforcement comprend un canevas léger.

8. Stratifié d'étoffe renforcée et non tissée, qui comprend deux couches de fibres enchevêtrées d façon lâche t une couche de renforcement interposée fixée aux couches de fibres, chaque couche de fibres nchevêtrée de façon lâche comportant un motif de zones de haute densité interconnectées par des fibres s'étendant entre les zones et ayant une face à jets et une autre face, les faces à jets des couches fibreuses formant les surfaces extérieures du stratifié d'étoffe et portant une couche de liant appliquée sur elles.